



**Reducing Bird-Strike Risk at Portsmouth
International Airport (PSM) through Research on
Breeding Upland Sandpiper Habitat
Final Report**

Prepared by the New Hampshire Fish and Game Department for the
New Hampshire Department of Transportation in cooperation with the
U.S. Department of Transportation, Federal Highway Administration

1. Report No. FHWA-NH-RD-14282U		2. Gov. Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Reducing Bird-Strike Risk at Portsmouth International Airport (PSM) Through Research on Breeding Upland Sandpiper Habitat		5. Report Date June 2013	
		6. Performing Organization Code	
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9. Performing Organization Name and Address New Hampshire Fish and Game Department 11 Hazen Drive Concord, NH 03301		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. 14282U, A000(852)	
12. Sponsoring Agency Name and Address New Hampshire Department of Transportation Bureau of Materials and Research Box 483, 5 Hazen Drive Concord, New Hampshire 03302-0483		13. Type of Report and Period Covered FINAL REPORT	
		14. Sponsoring Agency Code	
15. Supplementary Notes In cooperation with the U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION			
16. Abstract This report summarizes the results of a study to identify the habitat use and behavior of the upland sandpiper, a state-endangered bird species, at Portsmouth International Airport (PSM), which is near the Great Bay National Wildlife Refuge (GBNWR). The study determined that PSM provides the nesting habitat for 10 to 15 pairs of upland sandpipers. Despite several surveys at other suitable grassland habitats, including sites within GBNWR, biologists have not recorded any breeding activity outside of PSM. The study identified wildlife hazards and attractants on the airfield and made recommendations to minimize said hazards thereby protecting the state-endangered bird species. The management plan at PSM was modified to fit USDA Wildlife Services guidelines and provide a mowing regime to minimize the risk to the upland sandpiper. Recommended best management practices include: modifications to the mower's flushing bar, the cutting height and time of year for cutting, improve and create additional habitat areas at GBNWR, and continued monitoring of impact on the upland sandpiper at PSM.			
17. Key Words Bird strike, habitat (ecology) management, airport, mowing, upland sandpiper, state-endangered bird species		18. Distribution Statement No Restrictions. This document is available to the public through the National Technical Information Service (NTIS), Springfield, Virginia, 22161.	
19. Security Classif. (of this report) UNCLASSIFIED	20. Security Classif. (of this page) UNCLASSIFIED	21. No. of Pages 34	22. Price

Reducing Bird-Strike Risk at Portsmouth International Airport (PSM) Through Research on Breeding Upland Sandpiper Habitat

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New Hampshire DOT Research Record



Upland Sandpiper Research at Portsmouth International Airport

Final Report June 2013

**Prepared by the NH Fish and Game Department for
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Contributing authors: John Kanter, Toni Mikula, Diane DeLuca, and Heidi Holman

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The following report is based on findings of recent research conducted on state endangered upland sandpipers at Portsmouth International Airport (PSM). Comments and recommendations provided by the author are based on data collected, previous monitoring and research of upland sandpipers at PSM, and current scientific literature and are not necessarily the official views or policies of the New Hampshire Fish and Game Department, NHDOT or FHWA.

Acknowledgements

The New Hampshire Fish and Game Department's Nongame and Endangered Wildlife Program would like to thank Diane DeLuca of NH Audubon, who contributed much of the 2009 and 2010 data and information contained in this report. Special thanks to Kevin Kalasz, Shorebird Project Coordinator for the Delaware Division of Fish and Wildlife, and Kate Zimmerman, graduate student from Michigan, for assisting in banding and transmitter application. Many thanks go to the cooperative effort of the US Department of Agriculture, Wildlife Services, especially Angelique Debutts and Carrie Stangel, the staff at PSM, and NH Fish and Game employees Brendan Clifford, Heidi Holman, Allison Keating, Heather Kleczek, and Toni Mikula. Members of the Technical Advisory Group (TAG) are thanked for their contributions to this research effort: Bill Real of NHDOT, Heidi Holman of NHFG, Parker Hall of the USDA, Mike Pouliot of NHDOT, Andrew Pomeroy of PDA Airport Management, Diane Deluca of NH Audubon, and John Kanter of NHFG. Thanks to the airport operations staff for all the rides to and from the study site and thanks to Jim Thurlow for creation of the flushing bar and his careful monitoring of the birds throughout the study and throughout the years.

Additional references are included at the end of this report.

Cover photo courtesy of New Hampshire Fish and Game.

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LIST OF ACRONYMS

- GBNWR- Great Bay National Wildlife Refuge
- NHA- New Hampshire Audubon
- NHFG-New Hampshire Fish and Game
- PSM- Portsmouth International Airport
- UPSA- Upland Sandpiper
- USFWS- United States Fish and Wildlife Service

EXECUTIVE SUMMARY

In 2010, New Hampshire Fish and Game (NHFG) implemented a study aimed at understanding upland sandpiper (UPSA) habitat use and behavior at Portsmouth International Airport (PSM). In addition, NHFG and New Hampshire Audubon (NHA) worked with airfield personnel and USDA Wildlife Services to identify wildlife hazards and attractants on the airfield and make recommendations to minimize these hazards. As the last remaining upland sandpiper nesting site in New Hampshire, NHFG, NHA, and PSM have been working together to monitor and protect UPSA here since 1990. Federal Aviation Administration Cert Alert (06-07) entitled “Requests by State Wildlife Agencies to Facilitate and Encourage Habitat for State-Listed Threatened and Endangered Species and Species of Special Concern on Airports” highlighted the importance of reviewing the existing management agreement.

A detailed understanding of the location and behavior of sandpipers using this area will help in the development of strategies to prevent the take of sandpipers and ensure that these grasslands will continue to provide nesting habitat. In order to determine the current breeding status of sandpipers in the seacoast region, NHA biologists surveyed historic nesting areas in Dover, Rochester and Newington for suitable grassland habitat. Out of 114 surveys, biologists were not able to record any observations of breeding activity. Biologists were unsuccessful in detecting upland sandpipers at other suitable sites in close proximity to PSM, including the Great Bay National Wildlife Refuge (GBNWR). Surveys concluded that PSM continues to be the stronghold of New Hampshire’s remaining UPSA population.

Continued monitoring of the upland sandpiper breeding population at PSM revealed that the birds used the full extent of grasslands on the airfield and used similar areas each year. In 2009, it was estimated that 11 pairs of upland sandpipers nested at PSM. The next year, three nests were found during nest search surveys, and observations of adults with chicks suggest that up to four additional nests were present on the airfield. In 2011, four nests were detected at PSM and additional observations of adults with chicks suggested that four more nests went undetected during surveys. Coordination with other airports that support upland sandpiper populations resulted in a refined nest search methodology, and revealed that some states are void of suitable UPSA habitat or formal UPSA management plans.

The closest alternative potential breeding site is GBNWR, but additional locations having limited potential are Fox Point in Newington and a private tract of land in Rollinsford. NHFG joined forces with U.S. Fish and Wildlife Service (USFWS) to improve habitat conditions for upland sandpipers at GBNWR in 2010. The weapons storage area was mowed and some portions of the Thomas Fields were treated to remove woody vegetation, but a shortage of manpower and equipment failures prevented completion of the management at this alternative site. Overall, these areas are small in comparison to PSM and would require intensified mowing or burning to be suitable for UPSA. To encourage use of alternative breeding sites by UPSA, contact was made with GBNWR staff to discuss management of habitat for UPSA in the future.

The existing management plan at PSM was modified to fit USDA guidelines for mowing and include monitoring of UPSA under the modified mowing regime. Future steps will include developing a more efficient strategy to locate nests and minimize the risk of damage by mowing. Best management practices provide strategies to reduce the number of mowing events during the breeding season while still maintaining regulation grass heights. Along with this, concerned parties should be included in meetings to develop best management practices for use in training mowing operators in future years. Best management practices include: modification of the mower's flushing bar, additional habitat improvements at GBNWR, and continued monitoring of impact on the UPSA population.

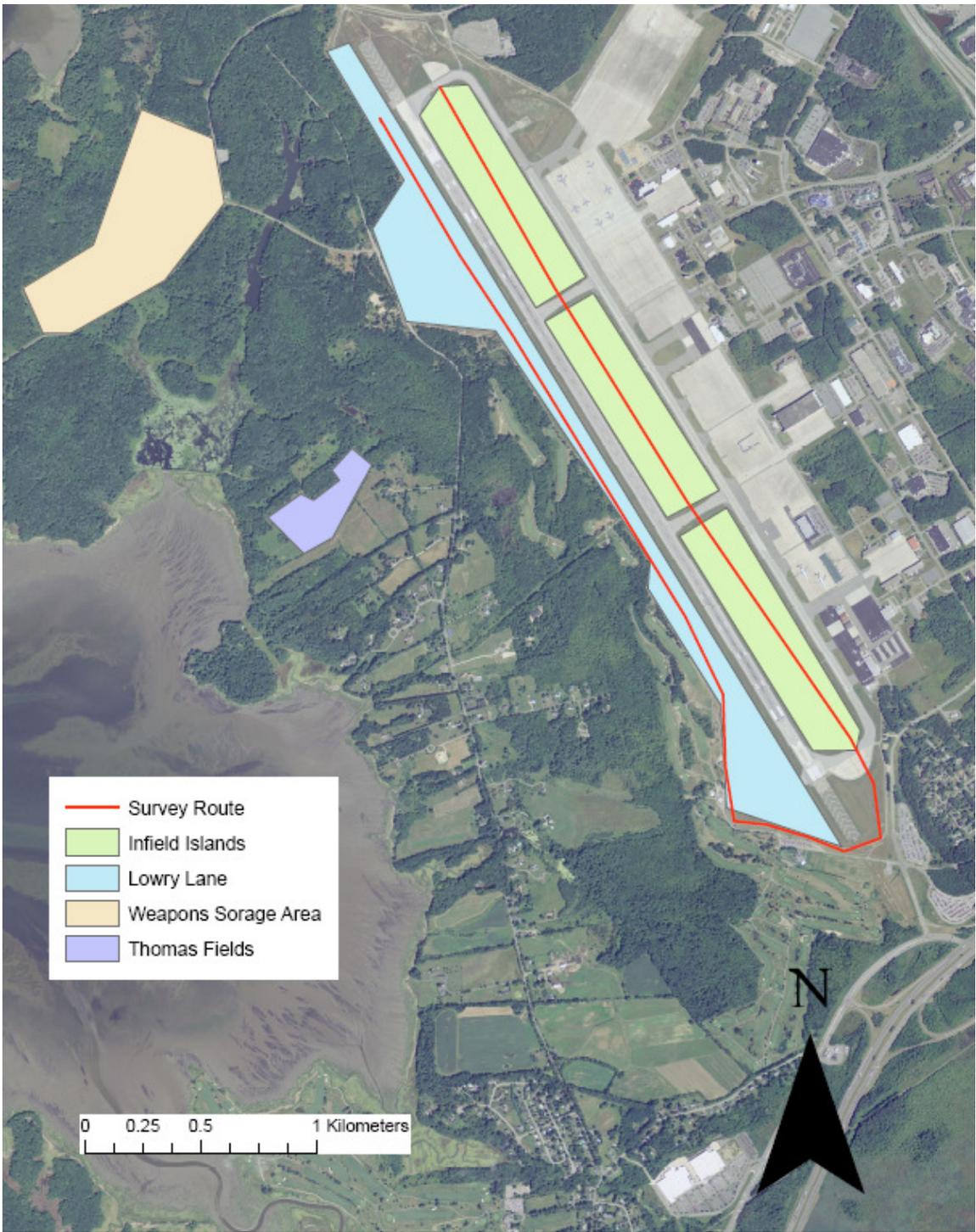


Figure 1. Potential upland sandpiper habitat management areas at Portsmouth International Airport and the nearby Great Bay National Wildlife Refuge.

INTRODUCTION

Upland sandpipers (*Bartramia longicauda*) require large areas of grasslands for foraging and breeding (Herkert 1994, Shriver et. al 2005, Vickery et. al 1994, Walk and Warner 1999). In a 1994 survey of New England's grassland birds, Vickery et al noted that UPSA were absent from habitats of less than 50 acres (20 ha), were infrequent in habitats of less than 125 acres (50 ha), and occurred on half of sites of 500 acres (200 ha) or greater.

For more than a decade, Portsmouth International Airport has been the only confirmed location of state endangered upland sandpipers nesting in New Hampshire. The most recent records of upland sandpipers nesting elsewhere in NH were of two pairs that nested at the Great Bay National Wildlife Refuge in 1997 and 1998.

At the initiation of this study in 2009, sightings from Dover, Manchester, and southern Coos County provided evidence that upland sandpipers were still visiting appropriate habitat elsewhere in the state. However, despite intensive surveys conducted by NHA in 2009 and 2010, no new nesting sites were found. The lack of evidence of nesting upland sandpipers is not surprising given the continual loss of grassland habitats that started with the wide-scale abandonment of farming in New Hampshire in the latter half of the nineteenth century. The subsequent maturation of forests has resulted in a landscape that is unlikely to again provide suitable nesting habitat for a bird species that depends on extensive grasslands.

In Connecticut, Massachusetts, and New Hampshire upland sandpiper nesting sites are restricted to airports (e.g. Bradley International, Westover Air Reserve Base, Pease International Tradeport respectively). With the exception of Maine's blueberry barrens, the extensive grasslands on and adjacent to large airfields are likely to remain the only suitable nest sites for upland sandpipers in New England.

Given the scarcity of nesting upland sandpipers in New England and the lack of nesting evidence outside of PSM in New Hampshire, we reevaluated the project objectives. In March 2010 NHFG recommended to the Technical Advisory Group that the focus of the study be shifted from searching for new nesting areas to developing a detailed understanding of upland sandpiper habitat use and behavior at PSA. We also requested that airport operations begin the mowing schedule designed to meet the 6-12'' safety standard recommended by USDA Wildlife Services and the Federal Aviation Administration (FAA).

In order to devise strategies to prevent "take" of upland sandpipers as defined in the New Hampshire "Endangered Species Conservation Act," and ensure that the grasslands at PSM continue to provide long-term nesting habitat for this state-endangered bird (even under a more intense mowing schedule that is meant to reduce the attractiveness of the airfield for wildlife posing a risk to aircraft) we needed to develop more extensive knowledge about the location and behavior of the sandpipers using the area. This new approach required more intensive nest searches, radio-tagging and banding studies of the

birds. The results of this detailed study of the breeding upland sandpiper population at PSM provided the basis for a long-term conservation strategy.

DETERMINE CURRENT STATUS OF BREEDING UPLAND SANDPIPERS IN THE SEACOAST REGION (TASK 1)

METHODS

New Hampshire Audubon biologists generated a list of historic upland sandpiper activity by using data stored and maintained by the NHA bird records program. Potential habitat in the Seacoast Region was mapped using the National Land Cover Data (NLCD) habitat types with overlays of grassland, pasture/hay and cultivated land. Biologists used standard bird monitoring protocols, conducting point count and broadcast surveys. In these point count surveys, biologists listened and observed at each point for five minutes to count the calls of UPSA in that location. Points were 300m apart and 100m from the field edge. Biologists also conducted broadcast surveys from mid-June thru July, playing recorded calls of UPSA and listening for the birds return call. Due to the timing of funding, these tasks could not be completed until well into the 2009 breeding season. To strengthen this data, the historic sites were revisited in 2010.

NHA biologists conducted site visits to historic nesting areas in Dover, Rochester and Newington, including the Great Bay National Wildlife Refuge. They recorded observations of any upland sandpiper breeding activity and determined if the site still had potential suitable habitat for upland sandpiper breeding. Biologists conducted multiple visits during the breeding season to detect upland sandpipers and to determine the habitat potential of the area. At each site, biologists conducted a grassland survey and collected the following data: GPS coordinates, current land use, abundance of grasses, forbs, shrubs, bare ground, and topography. A map was generated for each site and photos were also catalogued for all sites visited.

*Point count- A survey method often used for birds, where the observer listens for the unique call/song of a bird at a designated point for a set period of time. Guidelines to the survey such as distance between points, reduces biases such as hearing the same bird twice and also makes the survey easy to replicate.

**Broadcast survey- A survey method where the observer will play a recorded tract of a particular bird's call/song. If that bird hears the tract it will respond with a call back, if there is no response then it is assumed that bird is not present.

RESULTS

NHA biologists surveyed 114 point locations in 16 towns in the Seacoast Region of NH. No upland sandpiper activity was noted on any of the surveyed sites in 2009 and 2010. Aerial photographs depicting sites and survey points are found in Appendix D of NHA Final Report.

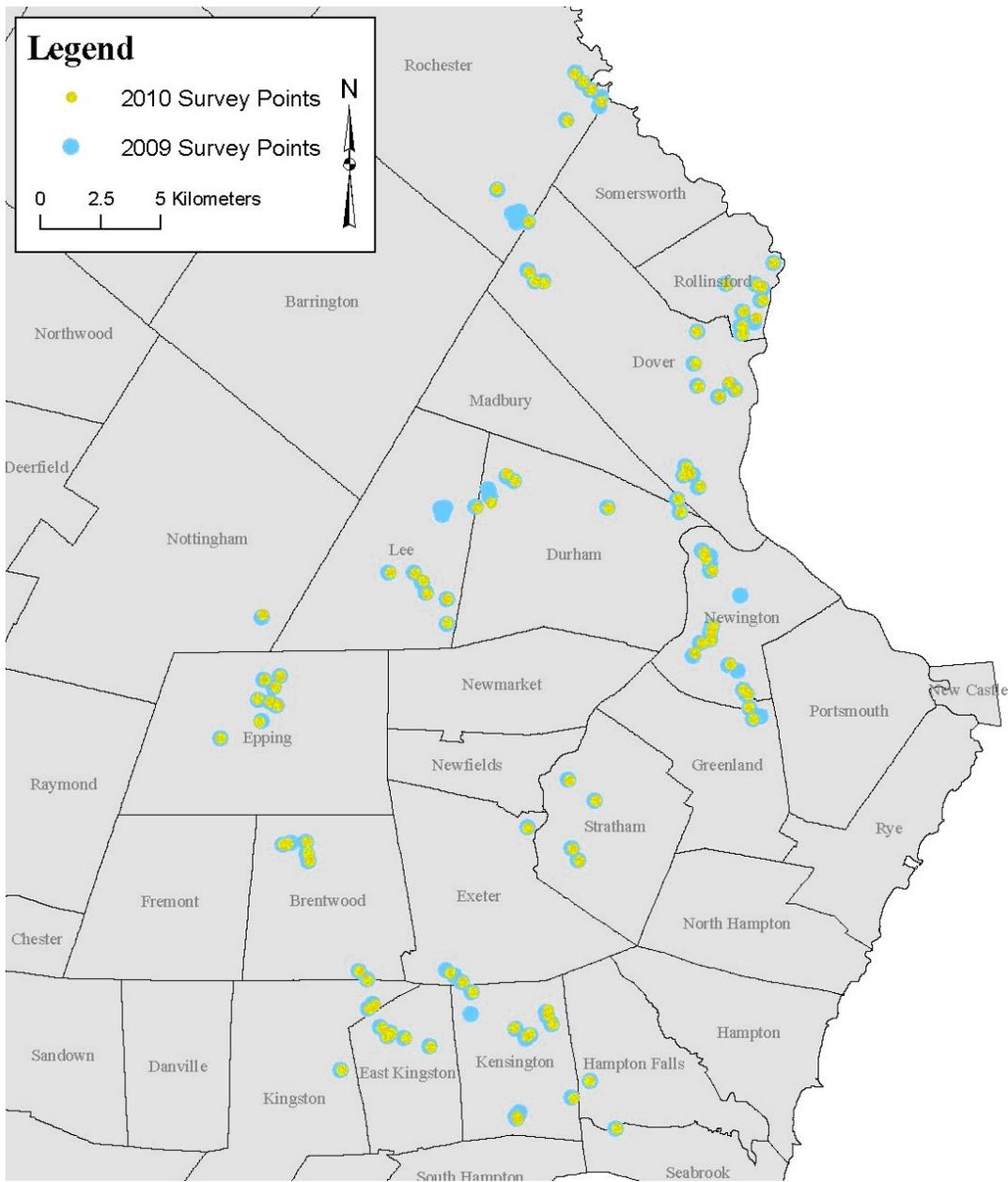


Figure 2. Potential upland sandpiper habitat and nesting locations surveyed in 2009 and 2010.

EVALUATE POTENTIAL UPLAND SANDPIPER HABITAT IN CLOSE PROXIMITY TO PSM OR IN CLOSE PROXIMITY TO OTHER BREEDING SITES THAT MAY BE DISCOVERED (TASK 2)

METHODS

NHA biologists surveyed seven sites (Figure 3) in close proximity to the known breeding pairs of upland sandpipers at PSM (survey methodology described in previous section). Two sites at GBNWR Refuge, the former Weapons Storage Area and the Thomas Field, were selected for further evaluation and consideration for management (Figure 1).

RESULTS

Biologists did not detect upland sandpipers among the seven sites surveyed, (Figure 3), including the former weapons storage area where birds had nested in 1997 and 1998.



Figure 3. Survey sites for potential upland sandpiper nesting near known breeding pairs at Pease International Airport.

MONITOR THE UPLAND SANDPIPER BREEDING POPULATION AT PSM TO DETERMINE NESTING LOCATIONS AND CONDUCT A VEGETATION ANALYSIS OF THE IDENTIFIED NESTING HABITAT (TASK 3)

METHODS

Upland Sandpiper Observations

In 2009 and 2010, biologists from NHA surveyed PSM twice weekly from 24 April to 2 July and weekly from the middle of July through 1 September. The regular survey route began at the north island and proceeded through the middle and south islands (Figure 1). The observer then continued the route by turning west and then heading north along Lowry Lane to the 3000' marker across from the north island. Biologists scanned the area and used binoculars and/or a spotting scope to identify upland sandpipers and observe their activity. To obtain maximum coverage of the habitat, the biologist walked a broad zigzag pattern through the areas. During each visit to the airfield field notes were recorded including: date, time, weather, number, age class and behavior of upland sandpipers observed. Observed behaviors were categorized as either courtship, nesting, in flight or flushing from the ground. Each observation was marked on a map in one of 13 wildlife sectors identified by USDA Wildlife Services for hazardous wildlife surveys (Figure 4) and the locations were digitized into GIS. In 2010 NHFG hired an additional biologist to increase the frequency of monitoring activity and augment data collected by NHA biologists. In 2011 only the NHFG biologist was conducting monitoring activities on the airfield.

Nest Surveys

In 2009, behavioral observations were used to estimate approximate numbers and locations of upland sandpiper nests. In 2010, we initially used behavioral cues of adults to attempt to identify nest locations. We then marked the four corners of a 50x50 meter area around suspected nests to protect them from mowing. During subsequent visits we were unable to consistently observe upland sandpipers in the protected areas. We surmised that these areas did not contain nests and decided to explore more precise methods to determine the actual nest locations and prevent unintentional mowing of nesting birds. Two biologists searched for nests by dragging a 100ft rope between them, leaving enough slack to ensure contact with the grass. Because upland sandpipers often hold tightly to their nests, the rope was needed to nudge them to fly. Once the biologists flushed a bird, the area was carefully searched until the nest was found.

Dragging at PSM started 2 June 2010, and continued until 23 June 2010. In 2011, nest searching began on 12 May 2011 and continued periodically until 5 June 2011. For each nest we recorded the GPS coordinates and placed a white pin flag five paces south of the nest to aid in relocating it for future observation and banding attempts. In 2011, we also placed the metal portion of a flag immediately next to the nest if we were returning to capture the bird that night. The pin was removed immediately following capture attempts.

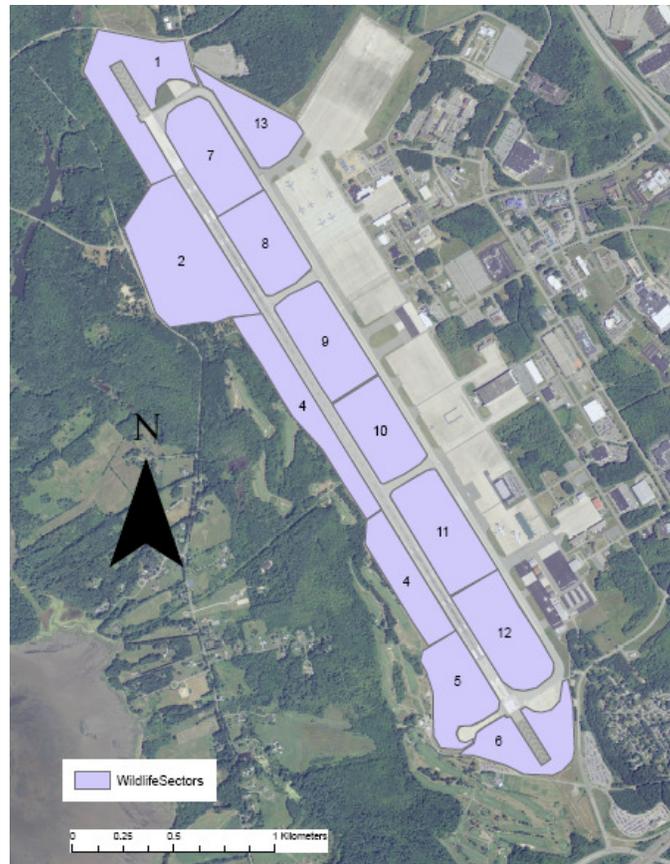


Figure 4. Wildlife Sectors used for mapping sandpiper observations and behavior.

Banding and Telemetry

In 2010, NHFG contracted with two ornithologists who specialize in shorebird research to accompany and train NHFG staff on how to capture, band and radio-tag upland sandpipers. We captured incubating adults by shining a bright light on them as we approached the nest. The bright light temporarily obscures their sight and allowed us to approach them closely. Adults were netted with either a dip net or mist net (starling-size mesh). Biologists banded birds with a United States Geological Service (USGS) #3 metal band on the lower right leg, and an alpha numeric color band above the left knee. We measured and recorded the following information for each bird banded: wing and chord length, total head length, culmen (bill) length, and weight. In addition we recorded the date, time, location, catch type, catch time, and time of weight. After recording the number of eggs in the nest we floated one egg in water to estimate the date of hatch using the technique described in Liebezeit et al. (2007).

In addition to banding the birds, we fitted adult sandpipers with radio transmitters manufactured by Advanced Telemetry Systems (ATS) Transmitter, model A2440, weighed 2.0 grams, which had a 125 day battery life. Radio transmitters were mounted to the lower back of the adult, positioned over the synsacrum, behind the wings and above the uropygial gland. We clipped feathers to roughly 0.5mm, glued gauze to the transmitter to roughen its texture, and then attached it to the feather stubble with

cyanoacrylate glue. This technique has been shown to be the best for attaching transmitters to adult upland sandpipers (Mong 2005; Mong and Sandercock 2007). It has also been demonstrated to work effectively on other shorebird species (Warnock and Warnock 1993). Following data collection, banding and mounting of transmitters, the birds were carefully released at their nest.

We captured and banded upland sandpiper chicks opportunistically during the study. We attached a transmitter to each chick with cyanoacrylate glue as described above. The transmitters were Lotek Biotrack Radio PIP Transmitter, PicoPip Ag337, which weighed 0.26-0.3 grams (including glue), and had a battery expectancy of 30 days.

RESULTS

Detecting Upland Sandpiper

We plotted all upland sandpiper observations for the three-year study and circled areas of concentrated activity using a different color for each year (Figure 5). Upland sandpipers used the full extent of grasslands on the airfield and used similar areas each year. However, the frequency of upland sandpiper observations varied considerably within and among nesting seasons.

Nest Surveys

NHA biologists used behavioral observations to estimate that 11 pairs of upland sandpipers nested at PSM in 2009. During the 2010 field season we found three nests with the rope-dragging technique, and the mower operator found the fourth after he flushed an adult that was incubating a nest (he was mowing in this area because biologists had searched it the previous day). We visited each nest periodically to check for hatch or depredation. Three nests failed, this was determined by either an early depredation event, or by not observing chicks with adults after the expected hatch date. Additional observations of adults with chicks provided the evidence for the presence of the four additional nests that were not detected during nest search surveys (Figure 5).

In 2011 we found four nests through similar means: three were discovered by biologists conducting rope-dragging surveys and an additional nest was identified by the mower operator. Following the flushing of an adult during mowing the day after dragging, a flushing bar was manufactured and attached to the front of the tractor to improve the chances of flushing a bird prior to driving over the nest (Figure 11. see management section for additional details). This nest was north of taxiway Delta in an area where upland sandpipers were not frequently observed. Of the four nests, two successfully hatched and two were depredated (Table 1). In addition to the nests that we actively located, we used observations of adults with chicks and the discovery of eggshells near a suspected nest to determine that an additional four nests went undetected in 2011

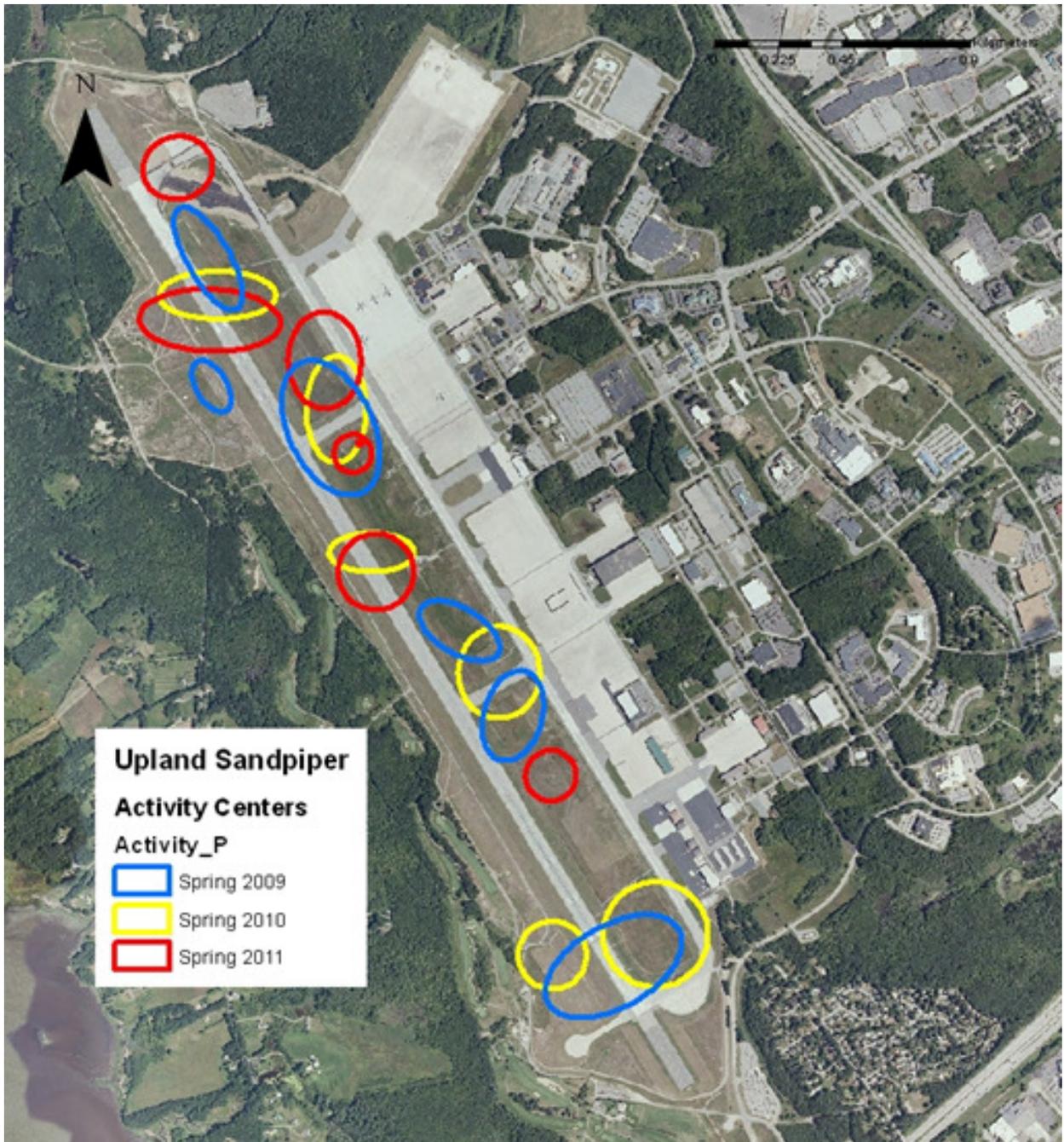


Figure 5. Areas of concentrated activity use of Portsmouth International Airport by upland sandpipers as determined by sightings in 2009 - 2011.

Table 1. Upland sandpiper nest locations at Portsmouth International Airport in Portsmouth, New Hampshire, in 2010-2011.

Nest No.	Date Located	Site Location	Located by Dragging	Estimated Initiation Date	Estimated Hatch Date	Date Nest Hatched	Date Nest Failed	Number Eggs Hatched
109	7-Jun-10	South Island	Y	26-May-10	6-22-2010	22-Jun-10		UNK
171	9-Jun-10	South Island	N	8-Jun-10	7-4-2010		14-Jun-10	0
191	13-Jun-10	North Island	Y	11-Jun-10	7-5-2010		29-Jun-10	0
100A	21-Jun-10	Lowry Lane	Y				22-Jun-10	0
1	26-May-11	North Island	Y			20-Jun-11		4
2	2-Jun-11	South Island	Y				22-Jun-11	0
3	6-Jun-11	North Apron	N			23-Jun-11		4
4	15-Jun-11	North Island	Y				30-Jun-11	0

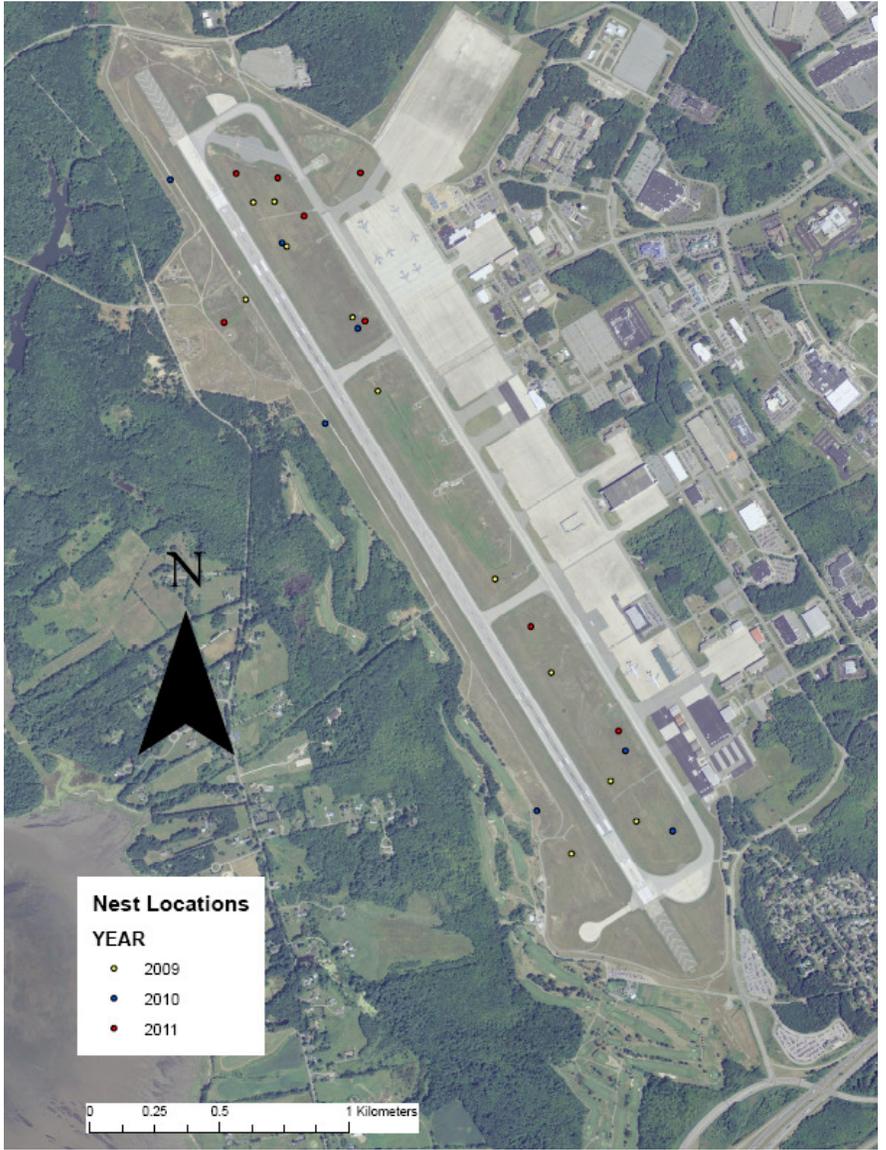
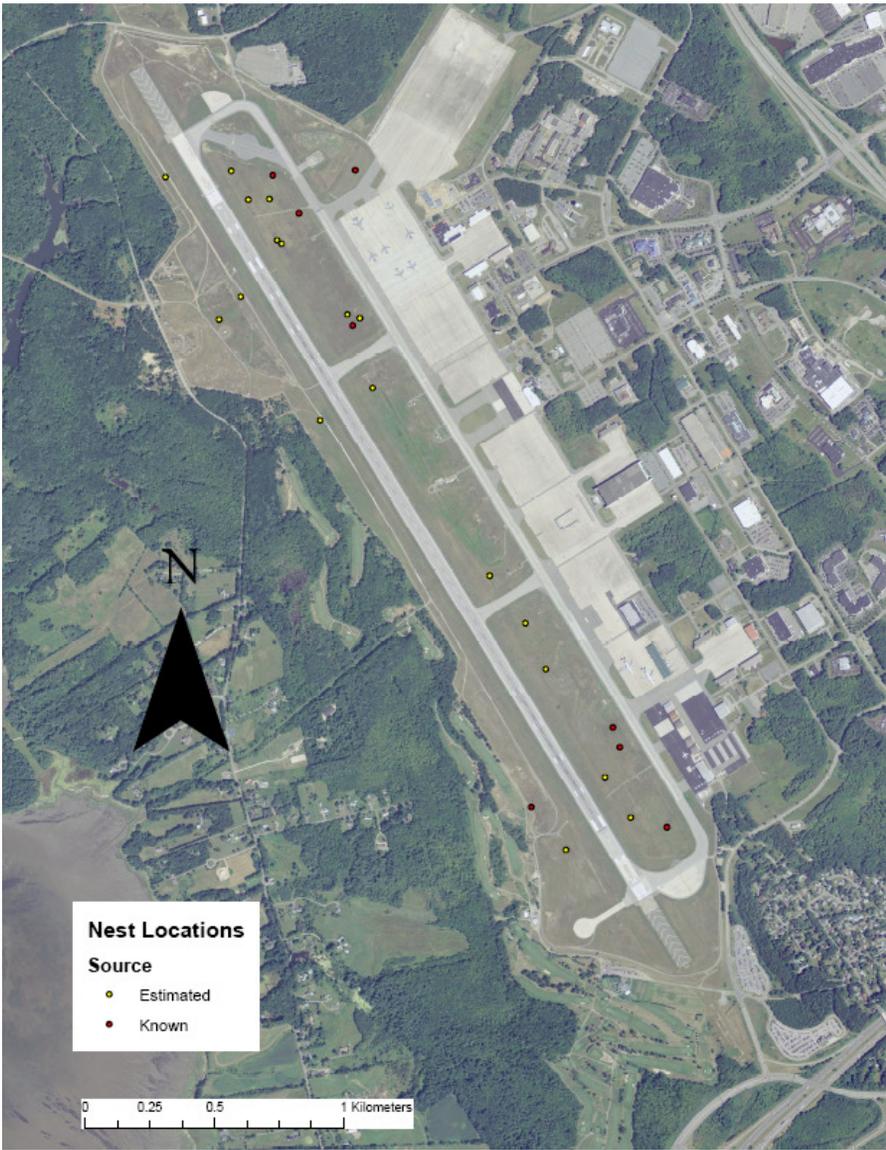


Figure 6. Known and estimated upland sandpiper nest locations at Portsmouth International Airport, 2009-2011.

Banding and Telemetry Results

In 2010, we captured five upland sandpipers and fitted them with radio transmitters (three adults and two chicks). The numbers of days the transmitters were attached and the number of data points collected for each bird is summarized in Table 2. Banding attempts were made on all nests but only two were successful. We captured, and then banded and affixed radio-transmitters to adults from two different nests (radio frequency 109 and 171) on 11 June 2010 in the South Infield. Bird 109 and bird 171's transmitters remained attached for 10 and 28 days respectively. On 23 June 2010 we banded and affixed transmitters to two chicks that were discovered by the mower operator.

Table 2. Results of upland sandpiper telemetry surveys at Portsmouth International Airport conducted in 2010-2011.

UPSA Transmitter Frequency No.	UPSA Total Weight	Date Captured and Banded	# Data Points	# Days Attached	Date Transmitter Dropped
109	170.0g	11 Jun 2010	5	10	22 Jun 2010
171	125.0g	11 Jun 2010	8	28	9 July 2010
191	110.0g	22 Jun 2010	5	8	1 July 2010
784	60.0g	23 Jun 2010	5	3	27 Jun 2010
905	58.0g	23 Jun 2010	3	7	7 Jun 2010
030	160.0g	7 Jun 2011	8	22	29 Jun 2011
109	141.0g	7 Jun 2011	8	23	30 Jun 2011
764	89.0g	1 Aug 11	0	1	N/A
885	80.0g	1 Aug 11	0	1	N/A

In 2011, we captured four upland sandpipers (two adults and two chicks). Bird 030 (nest 1) and bird 109 (nest 3) were banded on 7 June 11 and signals were received from them until the transmitters dropped off on 30 June and 29 June, respectively. A brood of three chicks were observed in the south infield near Taxiway B. Two chicks of this brood were banded on 1 August. The transmitters fell off almost immediately so few locations were obtained.

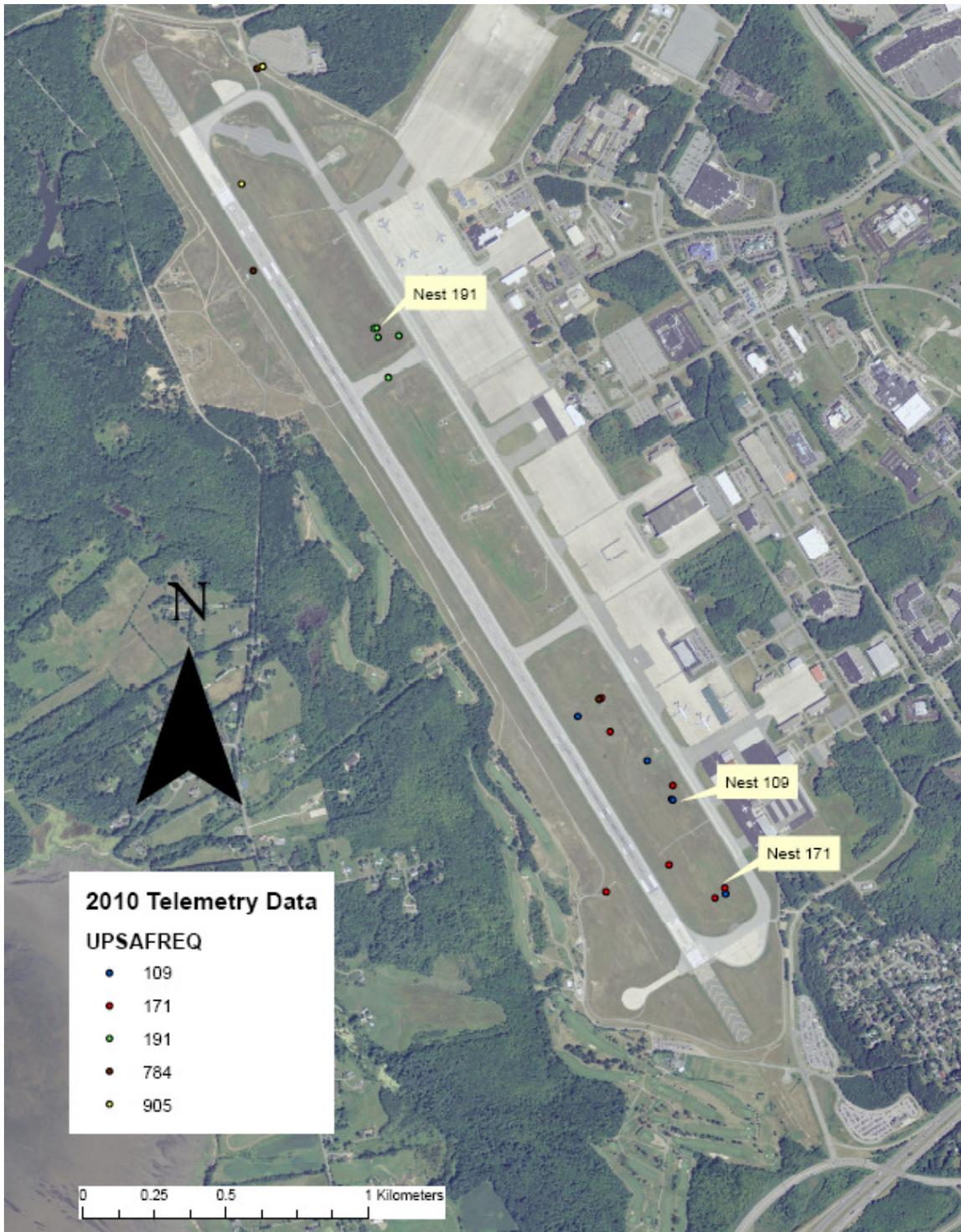


Figure 7. Radio locations for three upland sandpiper adults and two chicks at Portsmouth International Airport in 2010.

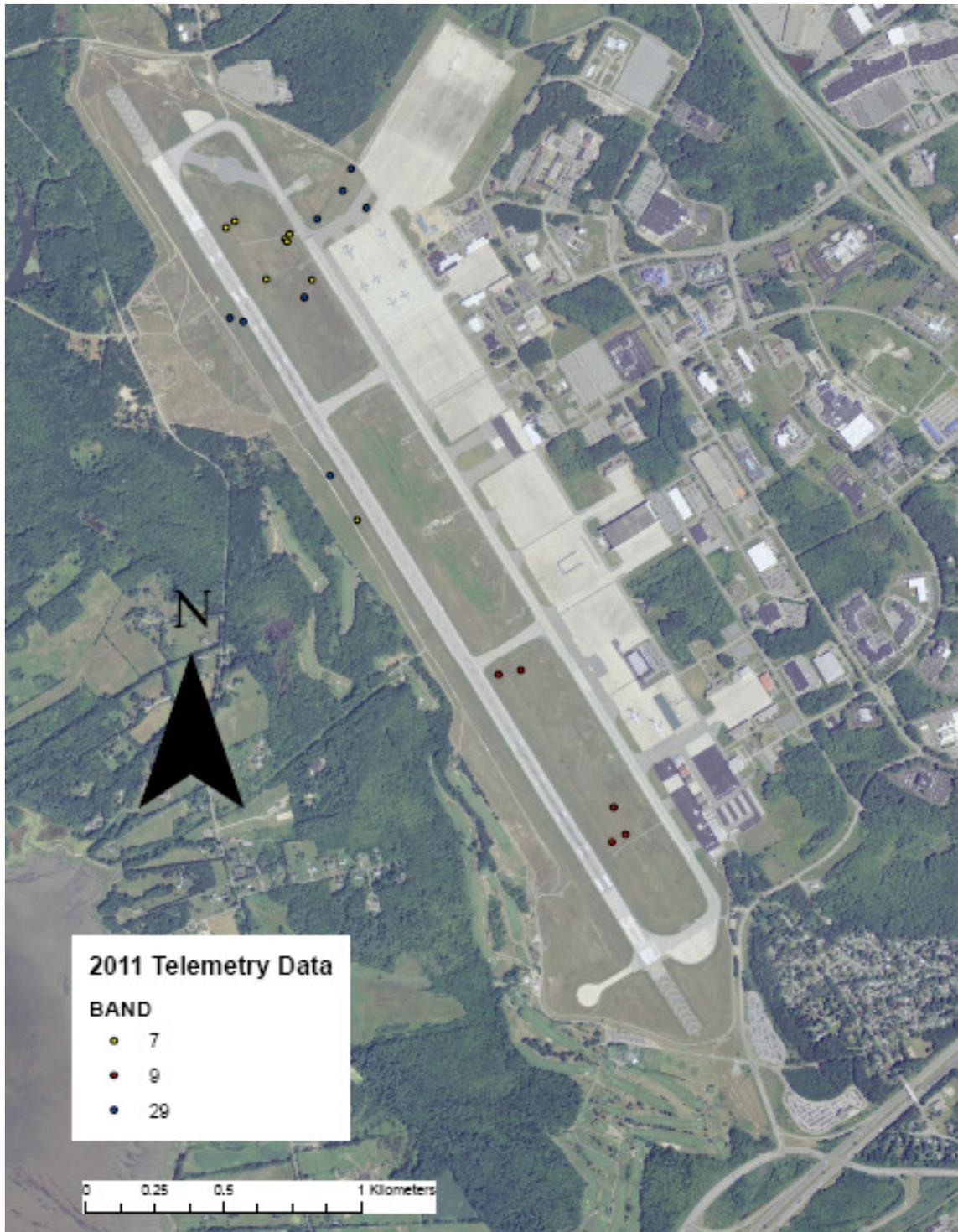


Figure 8. Radio locations for two upland sandpiper adults and two chicks at Portsmouth International Airport in 2011.

Movements were separated between nesting and post nesting activity. All movements were measured from the nest location for comparison. The movements during the nesting time were on average much closer to the nest locations than those measured following nest hatch or failure (Table 3). There was one long distance movement that was removed from the nesting movement data since it was an extreme outlier. The furthest movements during nesting were document just before hatching. All other movements were less than 600 feet from the nest. There was no detection of adult upland sandpipers leaving the airfield.

Table 3. Nesting and post nesting movements of adult upland sandpipers collected during telemetry work conducted in both 2010 and 2011.

Nesting Movements (ft)										
Year	Adult	Weight (g)	Move1	Move2	Move3	Move4	Move5	Move6	Average	ST Dev.
2010	191	110	480	105					292.5	265.17
2010	109	170	18	480	1257				585	626.14
2011	1	141	80	41	534	593			312	291.84
2011	3	160	279	351	457	1366			613.25	507.13

Post - Nesting Movements (ft)										
Year	Adult	Weight (g)	Move1	Move2	Move3	Move4	Move5	Move6	Average	ST Dev.
2010	171	125	697	1368	2616	2240	164	1328	1402.16	917.86
2011	3	160	1973	2039					2006.0	46.67
2011	1	141	635	717	3490				1614	1625.18

Overall, triangulating locations of the birds was difficult. The many radio and microwave signals being broadcast around the airfield coupled with many large metal objects interfered with the signal, and possibly with the compass as well, sometimes making it impossible to get an accurate bearing. In future years it will likely be more effective to follow a signal until a visual is obtained on a bird rather than attempting to triangulate. This will also aid in determining when a transmitter has fallen off since they are not equipped with mortality sensors.

FIELD VISITS TO OTHER AIRPORTS WITH UPLAND SANDPIPERS (TASK 4)

Most of the funding that was budgeted for traveling to other airports with upland sandpipers was redirected to the more in-depth nesting and radio-tracking studies at PSM. In order to fulfill the task of determining upland sandpiper monitoring and management strategies applied at other airports in New England, NHFG corresponded with colleagues via phone and email. Concurrent with the PSM study, Massachusetts Fish and Wildlife contracted with grassland bird specialists at New Jersey Audubon to evaluate the impacts of mowing on upland sandpipers and other grassland nesting birds at Westover Air Reserve Base (ARB). NHFG collaborated with NJ Audubon project manager, Kim Peters, to refine nest searching methodology and share results throughout the NH study.

Of the five New England states, three have upland sandpipers nesting on active airports (Table 4). No state wildlife agencies have a formal agreement with these airports. Nevertheless, Connecticut and Massachusetts do regularly monitor the populations and work with airfield managers to protect nests from being mowed. Massachusetts is using the results of the NJ Audubon research (Peters and Allen 2011) to develop long-term management strategies for integrating grassland bird conservation into airfield mowing operations.

Table 4. *New England upland sandpiper management strategies by state*

	Active Airports	Monitoring	Management Strategy	Formal Agreement
Connecticut	2	Annually	Delayed mowing areas outside of safety	No
Rhode Island	1	No	No	No
Maine	NA	NA	NA	NA
Massachusetts	2	Annually	Yes	No
Vermont	0	NA	NA	NA

IMPLEMENTATION OF GRASSLAND MANAGEMENT ON ALTERNATIVE SITES (TASK 5)

In 2010 NHFG staff worked with USFWS to improve habitat conditions for upland sandpipers at Great Bay National Wildlife Refuge (Figure 1). These areas include the Thomas field and the former Weapons storage area. In April, NHFG staff mowed portions of the Weapons Storage area, but were unable to complete the project because of equipment failures. USFWS staff and volunteers cleared woody vegetation and mowed portions of the Thomas Fields, but the lack of manpower and equipment failures also prevented them from completing the effort.

In 2011 Fish and Game Staff reviewed the habitat conditions at the Thomas field and Weapons Storage Area and provided management recommendations. In order for the Weapons Storage area to be suitable for UPSA, management would be needed in the form of additional mowing or burning, and removal of pavement and old buildings. Even with this management, the area is small compared to PSM and is not likely to be as attractive to UPSA as the airport.

The Thomas fields are small (20 acres) compared to PSM (~650 acres) and would require some management to be suitable for UPSA. The fields are becoming overgrown and are full of milkweed (*Asclepias spp.*), goldenrod (*Solidago spp.*), and other undesirable native plants as well as highly invasive glossy buckthorn (*Rhamnus frangula*) (Figure 9). In addition, the fields are interrupted by stands of trees and hedgerows, which increase edge and promote predators. During a visit in late summer the UPSA monitor noted bobolink fledglings and eastern meadowlarks, indicating that the area has potential as grassland habitat. However, shrubland species such as brown thrasher (*Toxostoma rufum*) and song sparrow (*Melospiza melodia*) were also present.



Figure 9. Looking north across the Thomas fields area of Great Bay National Wildlife Refuge in Newington, New Hampshire. Plants undesirable to grassland birds(such as milkweed, goldenrod and glossy buckthorn) should be removed.

In order to be made suitable for UPSA, standing trees and hedgerows must be removed. Glossy buckthorn and other invasive plants should be treated with herbicides to prevent recurrence after mowing. Mowing should take place several times a year from late summer through fall to prevent milkweed, goldenrod, and woody plants from becoming established. Seeding with native grasses may also be necessary. If cooperation from the abutting landowner can be achieved, this would nearly double the area of habitat

available (up to 40 acres) and makes the site more likely to attract UPSA from the nearby airport (Fig. 10).

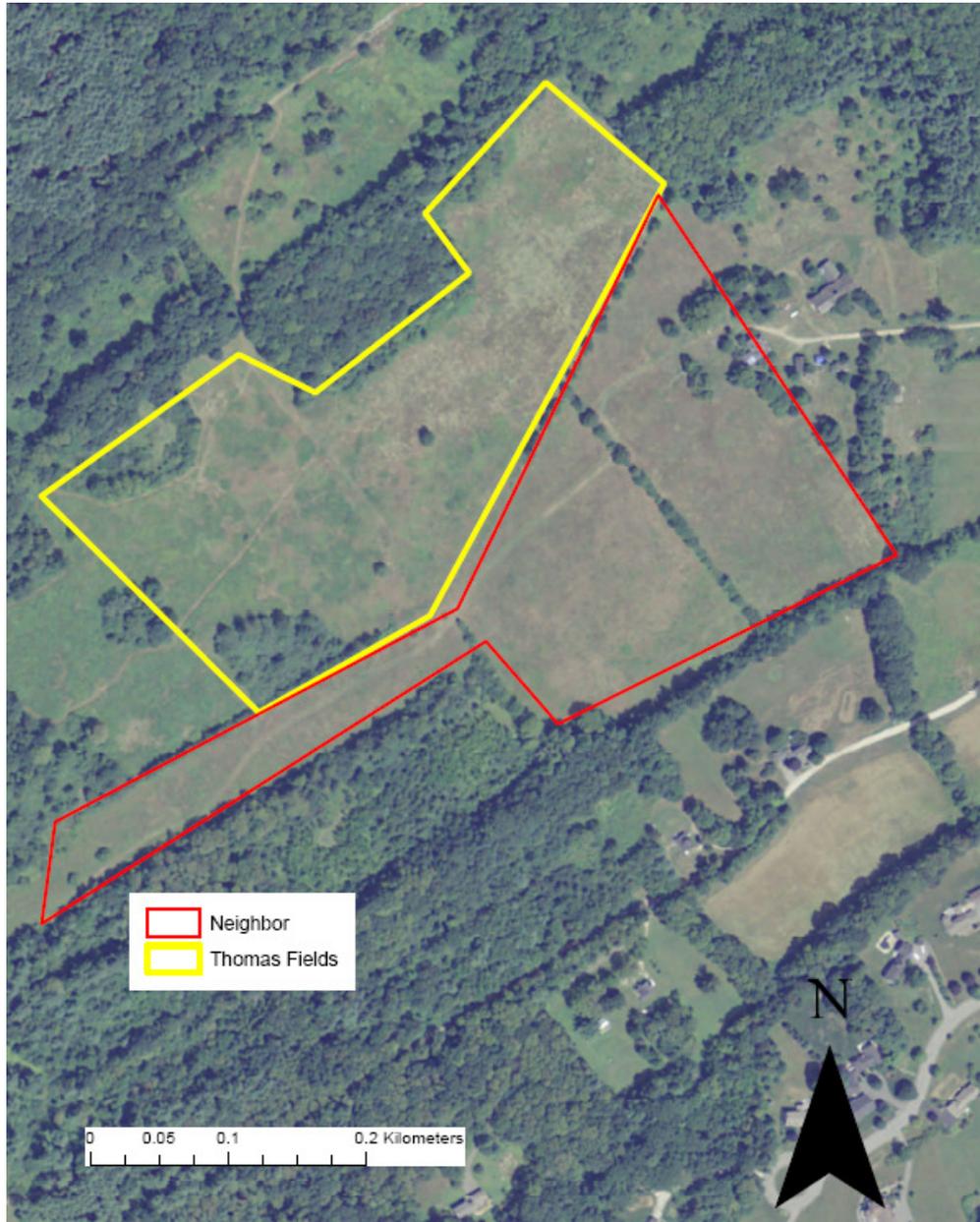


Figure 10. The Thomas fields area of Great Bay National Wildlife Refuge, Newington, NH. In order for these fields to be suitable to upland sandpipers, stands of trees) and hedgerows must be removed. It would also be desirable to acquire cooperation from the abutting landowner) thereby nearly doubling the size of the site.

DESIGN COORDINATED PLAN TO ENCOURAGE USE OF ALTERNATIVE BREEDING SITES BY UPLAND SANDPIPERS (TASK 6)

Attempts to encourage upland sandpipers to breed at alternative sites were limited to the habitat improvements made at the Great Bay National Wildlife refuge, specifically the former Weapons Storage Area and the Thomas Field (see task 8). Because surveys did not find any upland sandpiper activity at locations other than PSM and habitat conditions were not yet optimal for upland sandpipers, NHA did not attempt to use decoys and call recordings to encourage nesting as had been discussed in planning sessions.

GBNWR's proximity to PSM and its focus of providing habitat for migratory birds and other wildlife make it the most suitable area to manage future habitat management. GBNWR Comprehensive Conservation Plan (2012) calls for:

- *Annually manage the Thomas Field (39 acres) to maintain a mix of grass and herbaceous vegetation at mixed heights ranging from 8 to 24 inches during the summer, with minimal thatch build-up, less than 15 percent of total vegetation of woody species and greater than 5 percent bare ground, to provide nesting habitat for upland sandpiper and other grassland species of conservation concern.*
- *Annually manage the former Weapons Storage Area (38 acres) similar to the Thomas Field. If upland sandpipers do not breed in this field within 3 to 5 years, and no other grassland species of conservation concern would benefit from those grasslands, determine whether to allow the Weapons Storage Area Field to revert to shrubland. ,*

NHFG will continue to work with GBNWR to manage these areas for optimal grassland bird nesting characteristics. Nevertheless, these areas will only serve to supplement the more extensive grasslands at PSM because they do not meet the minimum habitat requirements for upland sandpipers (Vickery et al. 1994).

PILOT CHANGE TO EXISTING MANAGEMENT PLAN AT PSM (TASK 7)

The TAG met in March of 2010 to discuss a pilot management plan. USDA Wildlife Services stated that based on preliminary wildlife hazard information, the 2011 wildlife hazard assessment would recommend mowing in accordance with FAA guidelines.

Rather than evaluating the response of upland sandpipers to an alternative mowing strategy that would not be included in the recommendations of the Wildlife Hazard Assessment, we recommended to Technical Advisory Committee that PSM initiate this management strategy in 2010.

Miscommunication with PSM staff in 2010 resulted in the first mowing being conducted prior to the grass reaching the 6-12" height, and during the time when UPSA were initiating nests. In 2011 we met with USDA Wildlife Services, PSM, and evaluated the

condition of the airfield and agreed on an appropriate time for mowing to commence. We conducted nest searches so that nests were located prior to mowing.

Throughout our study, UPSA continued to successfully reproduce while the airfield was managed according to FAA guidelines. In 2010, although marked nests were lost to predation, we banded two chicks that survived from unmarked nests and observed additional juveniles with adults. The ability of UPSA to successfully nest under this management strategy is further supported by the results of a Massachusetts study that did not find a difference of nest survival between mowed and un-mowed areas at Westover Air Reserve Base (Peters and Allen 2011). The authors do caution that their information is based on relatively few nests, and that overall productivity (number of young surviving to fledging) was lower in mowed areas.

CREATION OF NEW MANAGEMENT PLAN AT PSM (TASK 8)

Best Management Practices

Keeping in line with our goals to reduce bird strikes at PSM while also protecting this state-endangered species, certain best management practices have been developed for the benefit of all parties involved. Early planning is necessary since sandpipers arrive in the area by the end of April, nest in May, and hatch by the end of June.

We recommend that PSM continue to mow in accordance with the Wildlife Hazard Assessment (WHA) prepared by Wildlife Services (see excerpt below).

Mow grass regularly to maintain a uniform height and to encourage dense uniform growth on the entire airfield of 6-12 inches (Appendix N and Q). Mow grass shorter than 6 inches only in FAA mandated areas around the safety area and lights. Maintaining uniform mowing heights where applicable by law will help reduce the number of species that hunt edge habitat (crows, coyote, fox, raccoon and skunk). Mowing in the spring can begin when the grass reaches 10-12 inches or grass seed heads form, typically end of May and June (upland sandpipers typically have initiated nesting before this time frame). It is recommended that the flushing bar constructed in 2010 continue to be utilized in the infields and on Lowery lane where upland sandpiper nests are confirmed. It is also important that the 16 glideslope near the lay down yard be mowed in early June and July because of the attractiveness to wild turkey hens and poults. If the grass is not cut until grass seeds have formed and insect populations are elevated then it is highly probable that Wildlife Hazard Assessment 2011 Portsmouth International Airport 62 these areas will be utilized frequently by hens with small poults (see Pease turkey report 2010).

A cooperative meeting of the USDA, PSM staff and NHFG should be held in early April each year. Communication among these agencies will ensure that WHA safety guidelines are being met, new or changing regulations are being understood, special concerns are being addressed, and that planning is done cooperatively.

Strategy 1: NHFG or a qualified contractor will monitor the airfield in April.

Strategy 2: NHFG will provide training to PSM on identification, behavior, and conservation of upland sandpiper.

Strategy 3: USDA, NHFG and PSM will meet to assess the grass height and determine when mowing will commence.

Strategy 4: PSM will mow safety areas first to reduce their attractiveness to nesting upland sandpipers.

Strategy 5: NHFG will attempt to locate and mark nests prior to an area being mowed.

Strategy 6: NHFG will accompany mower operator to flush the adult from the nest and direct the mower to raise the mowing deck to avoid damaging eggs.

Strategy 7: PSM mower operator will continue to use flushing bar and work with NHFG to periodically evaluate its effectiveness and make necessary modifications.

Strategy 8: NHFG will continue to monitor nesting progress and evaluate the need to complete a second search for nests.



Figure 11. NHFG biologist with flushing bar at Portsmouth International Airport.

REFERENCES

- Casey, A. 2008. Fine scale genetic structure and extra-pair parentage in the socially monogamous upland sandpiper. M.S. thesis. Kansas State University, 52 pages.
- Garber, S; Chevalier, S. and Cohen, J. 1997. Twenty-eight year study of upland sandpiper breeding population in New York. *North American Bird Bander* 22 :109-113.
- Gratto-Trevor, C.L. 2004. *The North American Banders' Manual for Banding Shorebirds*. 45 pages.
- Hayman, P., Marchant, J. and Prater, T. 1986. *Shorebirds: an identification guide to the waders of the world*. Houghton Mifflin Company, Boston, Massachusetts, USA. 412pp.
- Herkert, J.R. 1994. The effects of habitat fragmentation on Midwestern grassland bird communities. *Ecological Applications* 4:461-471.
- Higgins, K. and Kirsch, L. 1975. Some aspects of the breeding biology of the upland sandpiper in North Dakota. *The Wilson Bulletin* 87(1): 96-102.
- Liebezeit J, Smith P, and Lanctot R, et al. 2007. Assessing the development of shorebird eggs using the flotation method: Species-specific and generalized regression models. *Condor* 109: 32-47.
- Mong, T. 2005. Using radio-telemetry to determine range and resource requirements of upland sandpipers at an experimentally managed prairie landscape. MS thesis, Kansas State University, 77 pages.
- Mong, T. and Sandercock, B. 2007. Optimizing radio retention and minimizing radio impacts in a field study of upland Sandpipers. *Journal of Wildlife Management* 71: 971-980.
- Naef-Daenzner, B; Widmer, F. and Nuber, M. 2001. A test for effects of radio-tagging on survival and movements of small birds. *Avian Science* 1: 15-23.
- Peters, K. A. and Allen, M.C. 2011. Grassland bird nesting success on Westover Air Reserve Base, Massachusetts. Report to MA Division of Fisheries and Wildlife prepared by NJ Audubon Society Center for research education. 40 pages.
- Rappole, J.H. and Tipton, A. 1991. New harness design for attachment of radio transmitters to small passerines. *Journal of field Ornithology* 62: 335-337.
- Seutin G., White, BN, Boag, P. 1991. Preservation of avian blood and tissue samples for DNA analyses. *Canadian Journal of Zoology* 69: 82-90.

- Shriver, W.G., A.L. Jones, P.D. Vickery, A. Weik, and J. Wells. 2005. The distribution and abundance of obligate grassland birds breeding in New England and New York. Special Issue: Bird conservation implementation and integration in the Americas: Proceedings of the Third International Partners in Flight Conference, March 20-24, 2002, Asilomar, California. Editors: Ralph, C.J.; Rich, T.D.
- Vickery, P.D., M.L. Hunter Jr, and S.M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. *Conservation Biology* 8:1087-1097.
- Walk, J.W. and R.E. Warner. 1999. Program MARK: Survival estimation from populations of marked animals. *Bird Study* 46 Supplement, 120-138.
- Warnock, N. and Warnock, S. 1993. Attachment of radio-transmitters to sandpipers: review and methods. *Wader Study Group Bull.* 70:28-30.
- Weber, W., K.B. Scott, S.F. Marino, and G.W. Taylor. 2012. Great Bay National Wildlife Refuge and Karner Blue Butterfly Conservation Easement. USFWS, 4-1 to 4-66.